

Orchard Grafting Methods

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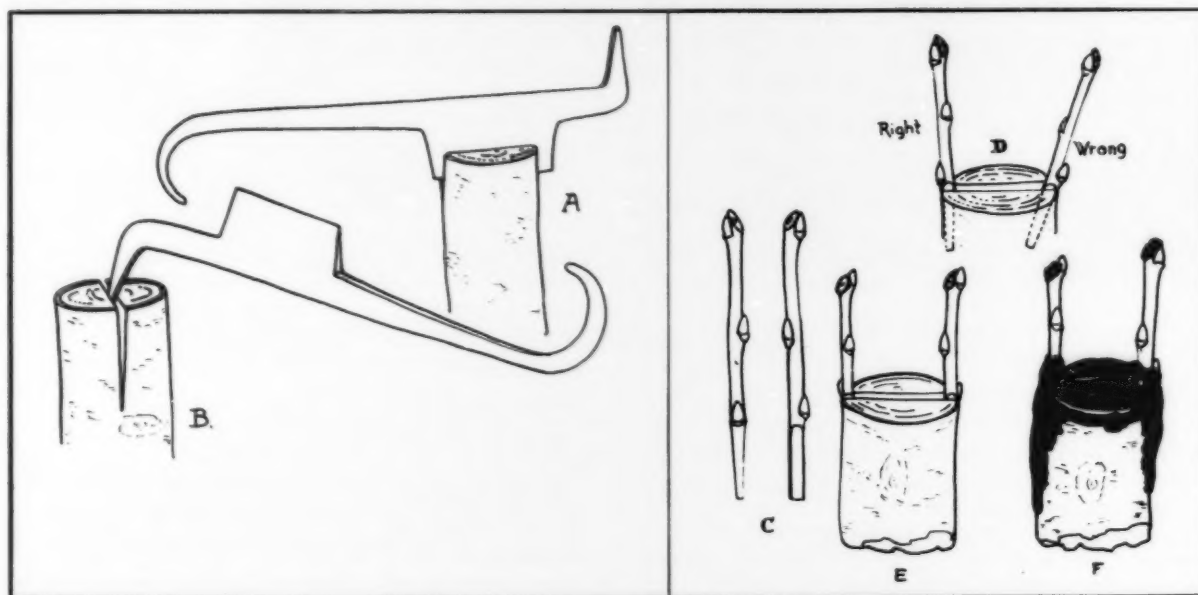


Figure 1. The cleft graft, in which two scions are placed in a cleft in a 3- to 7-cm stub.

There are many methods of grafting which differ only in detail of technique. Sometimes one method is superior for some particular purpose or occasion. At other times, the grafter has a choice of methods. Regardless of the method used, the principles involved remain constant.

To be successful at grafting, the grafter must first understand a few basic points about tree anatomy. The cambium is a thin layer of cells that lie between the bark and the wood. When the bark is peeled off a tree in the spring, the cambium is the slippery layer that separates. This is the growth layer on the tree or stock receiving the graft that must come in contact with the same layer on the piece to be grafted on, or scion (pronounced sigh-on). If these layers are permitted to contact each other over as much area as possible the wound begins to heal by forming callus, and the graft is usually successful. All types of grafting is easiest done, and with greater success, when the cambium is moist and active.

The cambium layer and resulting callus growth is very easily dried out and destroyed. Grafting compound (when

grafting), and rubber budding strips (when budding), should be used to prevent drying out. Grafting compound should be inspected twice at 2 to 3 day intervals to be sure it hasn't shrunk and cracked, or the graft will dry out and fail.

WOOD GRAFTS

With this type of graft the sapwood is split or cut and the wedged scion is placed in cambial contact with the stock. The scion is held in place by the tension of the stock so that no tying or nailing is necessary.

Cleft Graft

In this method, (Figures 1 and 2), the stock is a branch or trunk about 2 to 7 cm in diameter. If the stock is smaller or larger than this, it produces either too little of too much tension on the scion. The stock is first sawed across at right angles to the direction of growth at a spot that is straight and free from knots and branches. The stub is then split or "cleft" down the center with a heavy knife (or special grafting tool) and mallet. The cleft should be about 7cm long.



Figure 2. Cleft graft showing LEFT — the two scions in place, and RIGHT — the completed operation in which all wounded tissue is well protected with grafting compound.

The scions with 3 to 5 buds are cut to a blunt wedge-shape (Figure 1), with one edge of the wedge slightly thicker than the other. The wedge should be cut in such a way that the lowest bud of the scion will be immediately above the wedge on the thick side. The leaf growth from this bud will speed callus formation at the upper area of contact and result in rapid healing of the wound. Three-bud scions, with the top cut made near the upper bud, are commonly used.

The cleft is opened with a grafting iron or screw-driver, and the two scions are placed so that the cambium layers of scion and stock are in contact or very close proximity throughout the whole length of the scion wedge. This requires very careful cutting and placement of scions with due allowance for the differences in bark between scion and stock. Of importance too, is a uniform thickness of wedge for the two scions in any given stub. If one is thicker than the other, it may reduce the pressure by which the other is held, thereby preventing good contact. The grafting tool (or screw-driver) is then removed and all wound surfaces are thoroughly covered with a grafting compound.

To add additional strength to the newly set scions, some grafters will wrap two passes of PVC tape (electrical tape) around the cut end of the stub before applying the grafting compound.

The cleft graft can be used in topworking to replace a branch with one of another cultivar, or to change over the trunk and top of a tree that has been girdled.

Stub Graft

In stub grafting (Figure 3) the main framework of the tree is retained. All suitably placed branches, 1 to 2 cm diameter at the base and with wide-angled crotches, are used for grafting. Other branches are removed completely before or during the grafting operations. The terminals of all branches are cut off at a point immediately above the uppermost stub graft. The greater the number of scions used, the less will be the interruption of fruiting. In each sector of the tree, scions should be placed and wounds covered, working from the top of the tree towards the base.

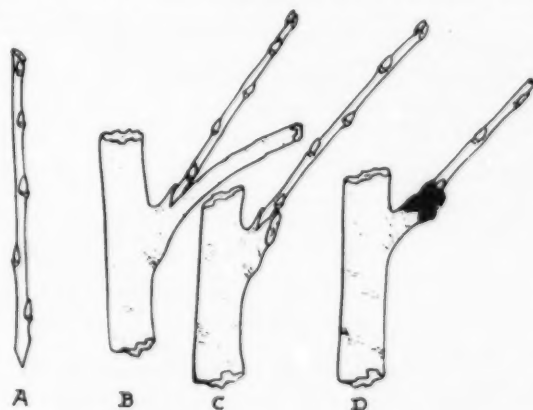


Figure 3. The stub graft can be used to advantage in frame-working. Here is the 6- to 8-bud scion (A) and the 3-step operation (B), (C), and (D).

This order eliminates the danger of accidentally displacing scions during the grafting operations.

Scions bearing 6 to 8 buds can be used. Longer scions allow for a greater leaf area per scion and encourage earlier fruiting. There is also some tendency towards better crotch angles between the scion and laterals arising from it.

Scions are cut with a short wedge at the lower end, one side slightly longer than the other. Beginning about one cm from the base of the lateral to be grafted, a diagonal cut is made towards the base and not more than halfway through the lateral. A relatively heavy knife with a straight or slightly concave blade is required for making this cut. The lateral is pulled downwards to open the cut for convenience in placing the scion, which is inserted with the longer side of the wedge underneath and with the cambium layers in line along one side of the cleft. The lateral is allowed to go back into position, and as a result the scion is held in place by tension, making tying unnecessary. The lateral is then cut off with a knife or sharp pruning shears as close as possible to the scion, and all cut surfaces are covered with a grafting compound. To ensure strong crotches, care must be taken not to create branch angles less than 35 degrees between the parent limb and the scion.

Side Graft

This method (Figure 4) is used to insert a number of grafts on a long, otherwise bare limb. It thus quickly provides a large leaf surface to replace what has been pruned off, it prevents sunscald, the fruiting area is brought in closer to the truck, and it provides laterals to fill in gaps on the branch.

In side grafting, the 6-to 8-bud scions are cut to a sharp wedge, about 2 to 3 cm long, with one side of the wedge thicker and longer than the other. A sloping cut is made with a heavy knife on the side of the limb of the stock and not more than one-quarter of the way through it.

By bending the branch slightly or opening the cleft with the knife, the scion is inserted, thick side of the wedge

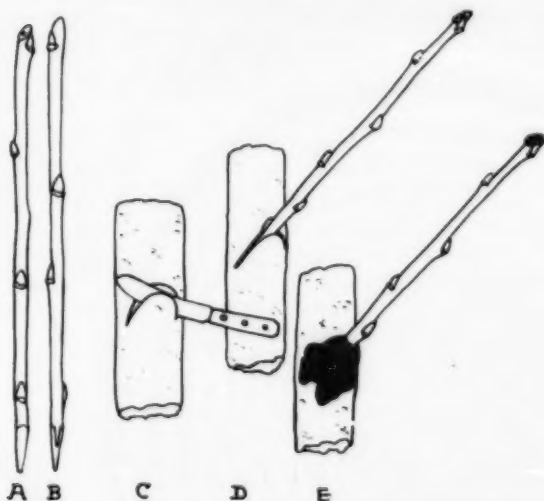


Figure 4. The side graft is a quick, simple method for placing scions anywhere on the branches of the stock.



Figure 5. Two bark-grafting methods. On the LEFT is the inverted "L" graft, and on the RIGHT is the "awl" graft. In each case the bark of the stock is slit and the wedged scion slipped between the bark of the wood.

uppermost, and pushed into the proper position for cambial contact with the stock. The scion should be so placed that narrow crotch angles do not develop between scion and stock. A coating of a suitable grafting compound, but no nailing or tying, is required.

BARK GRAFTS

With this type of graft the wood of the stock is not split or cut. Only the bark is lifted, allowing the cambium layers of stock and scion to be brought in contact.

A bark graft can be done successfully only after the cambium has become active in the spring, permitting the bark to lift or "slip" readily. This is usually about mid-May or later in Ontario.

Inverted "L"

Like the side graft, this is a very useful method in frameworking (Figure 5). Scions can be placed anywhere on the larger limbs. Make an inverted L-cut with an obtuse angle in the bark of the stock. Lift the bark from the wood and insert the bevelled end of a 6- or 8-bud scion beneath the bark. Using cigar box nails or berry box nails tack the scion in place and cover all wounded tissue with grafting compound.

Awl Graft

This is more quickly and simply done (Figure 5) than the inverted "L" method. It is, in fact, probably the simplest of all grafting methods. Scions can be grafted anywhere on the larger limbs.

A tool such as a bent screwdriver is used to make a slit in the bark. Insert the bevelled end of the scion into the slit and apply grafting compound. No taping or tacking is necessary. Be sure to insert the scions so as to avoid narrow-angled crotches.

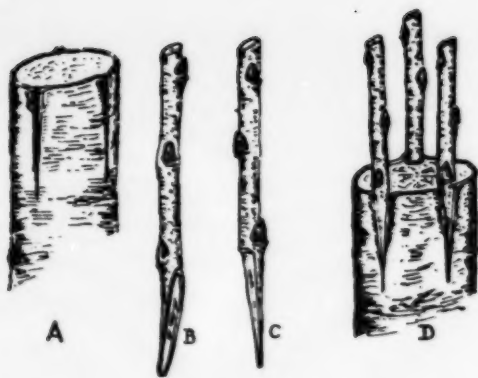


Figure 6. Veneer graft. (A) Slit stock ready for scion. (B, C) scion with straight bevel and shoulder bevel (D) scions nailed in place.

Veneer Graft

Veneer or inlay grafting is a method for topworking large trees where it is difficult or impractical to cleft-graft stubs larger than 3cm in diameter, and where growth is desired on large bare limbs. Scions somewhat thicker than a lead pencil are the best. The scions may be 5 to 15 cm long, including one or more buds. A 2- to 5-cm bevel to the pith is made at the base of the scion, with or without a shoulder (Figure 6). The stock is cut and prepared for the scion by cutting one slit (if bark is thin) or two parallel slits the width of the scion (if the stock is large and the bark thick). The bevelled scion is positioned under the bark and nailed. For additional strength 2 layers of PVC tape is often wrapped around the stub next to scions. The scions are spaced about 5 cm apart around the stock and treated with grafting compound. Spurs will form the second year and bloom the third. Some crop should be harvested the third year and a full crop by the fifth or sixth year. An entire block of trees can be topworked by spreading the job over a 4- to 6-year period.

The scions should be placed within a metre of the main crotch and on scaffold limbs approaching a 45-degree angle; almost-vertical limbs are unsatisfactory. The scions should be placed somewhat on the sides of the scaffold limbs, and not on top, for best results.

After shoots from these grafts have grown two or three years, the best can be selected for permanent scaffold limbs. The top of the tree can be gradually opened over a period of from four to six years or more. This will admit more light and room to the new limbs, while the old unneeded limbs are gradually pruned away and eventually removed.

Bud Graft (Budding)

Budding is done in the summer when buds of the current season are well formed and the bark slips well. It may take place in July or early August, depending on the geographic locality and the kind of fruit. Buds may be too immature for successful budding, but seldom are too mature.

Cut shoots (budsticks) of the current season's growth from trees of known fruit quality (Figure 7). Promptly remove leaves and keep the budsticks moist. Leaving a short portion of the petiole in place as a "handle", wrap the budsticks in moist cloth, in plastic bags, or place them with the basal end in water in a container. They can thus be



Figure 7. Bud graft (budding). (A) Terminal growth of current season, the source of buds. (B) Prepared budstick showing method of cutting the bud. (C) The shield bud. (D) The T-cut in the stock. (E) Bud in place. (F) bud tied snugly against stock.

stored in a cool place for several days; but it is better to use them soon after cutting. Use the well-developed, plump and hard buds from the mid-portion of the shoot.

Prepare the seedling nursery stock by stripping off the lateral shoots on the lower 15 cm of the stem in early summer. Wipe the stock clean of soil particles near the point of bud insertion.

At budding time make a T-cut in the bark of the stock through the bark to cambium depth (not into the wood). Twist the knife blade to raise the edges of the bark just enough, without tearing, so that the bud may be easily inserted.

Cut the bud with a thin shield of bark attached and retain the thin strip of wood that is cut with the shield.

After cutting, hold the bud by the petiole and insert it into the T-shaped incision. A properly inserted bud is at least 2 cm below the transverse cut. Avoid undue manipulation or prying of the bark flaps and be sure the bud is not upside down.

Buds are usually placed on the same side of the stock along the row so that they may be readily seen the following season. The side from which prevailing winds come is the preferable one to prevent breakage.

After inserting the bud wrap it snugly. Be sure to leave the bud exposed. Rubber budding strips are available for this purpose.

The first indication that the bud has united with the stock is the dropping off of the leaf stem. In successful budding, the bud usually will have grown to the stock in 2 to 3 weeks. Shriveled adhering leaf stems often indicate failure. If the bark still separates readily from the wood, a new bud may be inserted in a new position on the stock.

Buds inserted in late July or later remain dormant until the following spring. Buds properly united with the stock do not require any winter protection. Cut off rootstocks immediately above the grafted bud in early spring before growth starts.

Rub off all suckers that appear on the rootstocks during spring and early summer; 2 to 3 "sproutings" may be necessary before growth from the inserted bud is strong enough to be completely dominant. Maintain healthy foliage and good growth by weed and pest control, fertilization, and, if necessary, by irrigation.

Acknowledgement

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